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**North Carolina Department of Transportation
Planning and Research Branch
Thoroughfare Planning**



Moore County Thoroughfare Plan



March, 1987

THOROUGHFARE PLAN
for
MOORE COUNTY, NORTH CAROLINA

Prepared by the:

Thoroughfare Planning Unit
Planning and Research Branch
Division of Highways
N. C. Department of Transportation

In Cooperation with:

The County of Moore
The Federal Highway Administration
U. S. Department of Transportation

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I. INTRODUCTION

The economic growth of a region can be greatly influenced by how efficiently the transportation system handles travel demands. If the system fails to provide the means for quick and convenient transportation of people and goods, the region's economic growth becomes stagnated and fails to reach its full potential. It is necessary that such a system not only meet existing travel demands, but also that it keep pace with the development of the region. This report will set forth a system of thoroughfares to serve the anticipated traffic and land development needs of Moore County for the next twenty years. In the development of the system of thoroughfares, certain priorities shall be established based on maintenance needs, inadequate bridges, poor horizontal and vertical alignment, and insufficient present and future capacity.

The system of thoroughfares proposed was developed following the basic principles of thoroughfare planning as described in Chapter 11 of this report. Major thoroughfares were located based upon existing and anticipated travel demands, existing streets, existing and anticipated land developments, topographic conditions, and field investigations. The plan advocates those improvements which are felt to be essential for proper traffic circulation within the current planning period (1986-2005). The Moore County Thoroughfare Plan does not attempt to modify the thoroughfare plans adopted in the Aberdeen-Pinehurst-Southern Pines area or in Carthage. These plans are described briefly in Chapter 3.

Traditionally, county road improvements have been the sole responsibility of the North Carolina Department of Transportation. However, Moore County can provide assistance in the implementation of the plan through its subdivision regulations and zoning ordinances. With a growing demand for different governmental agencies to assist in developing the thoroughfare system, coordination of activities is of prime importance. Thus, it will be desirable for the plan to be formally adopted by both the County Commissioners and the North Carolina Department of Transportation to serve as a mutually acceptable official guide toward providing a well coordinated, efficient, and economical major road system.



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II. COUNTY THOROUGHFARE PLANNING PRINCIPLES

Purpose of Planning

There are many benefits to be gained from thoroughfare planning, but the primary objective is to assure that the road system will be progressively developed in a manner that will adequately serve future travel desires. Thus, the cardinal concept of thoroughfare planning is to make provisions for street and highway improvements so that when needs arise, feasible opportunities to make improvements exist.

Streets, roads, and highways perform two primary functions. They provide traffic service and land service. When combined, these two functions are basically incompatible. This conflict is not serious if both traffic and land service demands are low. When traffic volumes are high, however, access conflicts created by uncontrolled and intensely used abutting property result in intolerable traffic flow friction and congestion.

The major benefits derived from thoroughfare planning are twofold. First, each road or highway can be designed to perform a specific function and to provide a specific level of service. This permits savings in rights-of-way, construction, and maintenance costs, protects residential neighborhoods, and encourages stability in travel and land use patterns. Second, local officials are informed of future improvements. Developers can design subdivisions to function in a non-conflicting manner. School and park officials can better locate their facilities. Damage to property values and community appearance that is sometimes associated with road improvements can be minimized.

County Thoroughfare Planning Concept

The underlying concept of the thoroughfare plan is that it provides a functional system of streets roads and highways which permit travel from origins to destinations with directness, ease, and safety. Different elements in the system are designed to perform specific functions and to provide expected levels of service, thus minimizing the traffic and land service conflict.

Within the county plan, elements are considered to be either urban or rural. In the urban planning area, the local municipality generally has planning jurisdiction. Outside the urban planning area, the county has planning jurisdiction. In those urban areas where no urban thoroughfare plan has been developed, elements are generally considered to be rural and under the planning jurisdiction of the county. When a thoroughfare plan is developed for an urban area that has not previously had a plan, then the area defined by that plan would be considered urban and come under the planning jurisdiction of the municipality.

Within the urban and rural systems, thoroughfare plan elements are classified according to the specific function which they are to perform. A discussion of the elements and functions of the two systems follows.

Urban Thoroughfare Classification System

In the urban thoroughfare plan, elements are classified as either local access streets, minor thoroughfares or major thoroughfares. Local access streets which may be further classified as residential, commercial, or industrial streets are designed only to provide access to abutting property. Minor thoroughfares are more important streets in the urban system and are designed to collect traffic from local access streets and carry it to the major thoroughfare system. They may also serve abutting property and serve some minor through traffic movements. The major thoroughfares are the primary traffic arteries of the urban area providing for traffic movements within, around, and through the area.

Due to the limited amount of detail that can be shown on a county thoroughfare plan, only selected urban major thoroughfares are shown. A coordinated system of major thoroughfares which is most adaptable to desire lines of travel within an urban area and reflected in most urban area thoroughfare plans is the radial-loop system. The radial-loop system includes radials, crosstowns, loops, and bypasses. Radial thoroughfares provide for travel from points outside to major destinations inside the urban area. Crosstown thoroughfares provide for traffic movements across the central area and around the central business district (CBD). Loop thoroughfares provide for lateral travel movements between suburban areas. Bypasses are designed to carry non-local traffic around or through the area. Occasionally a bypass with low through traffic volumes can be designed to function as a portion of an urban loop. The radial-loop major thoroughfare system concept and concept of functionally classified urban street system are illustrated in Figure 1.

Rural Thoroughfare Classification System

The rural system consists of those facilities outside the urban thoroughfare planning area boundaries. They are classified into four major systems: principal arterials, minor arterials, major and minor collector roads, and local roads. Table 1 indicates generally accepted statewide mileage on these systems.

Table 1	
Rural System Road Mileage Distribution	
<u>Systems</u>	<u>Percentage of Total Rural Miles</u>
Principal arterial system	2- 4
Principal arterial system plus minor arterial road system	6-12
Collector (Major plus minor) road system	20-25
Local road system	65-75

FIGURE 1

IDEALIZED THOROUGHFARE PLAN

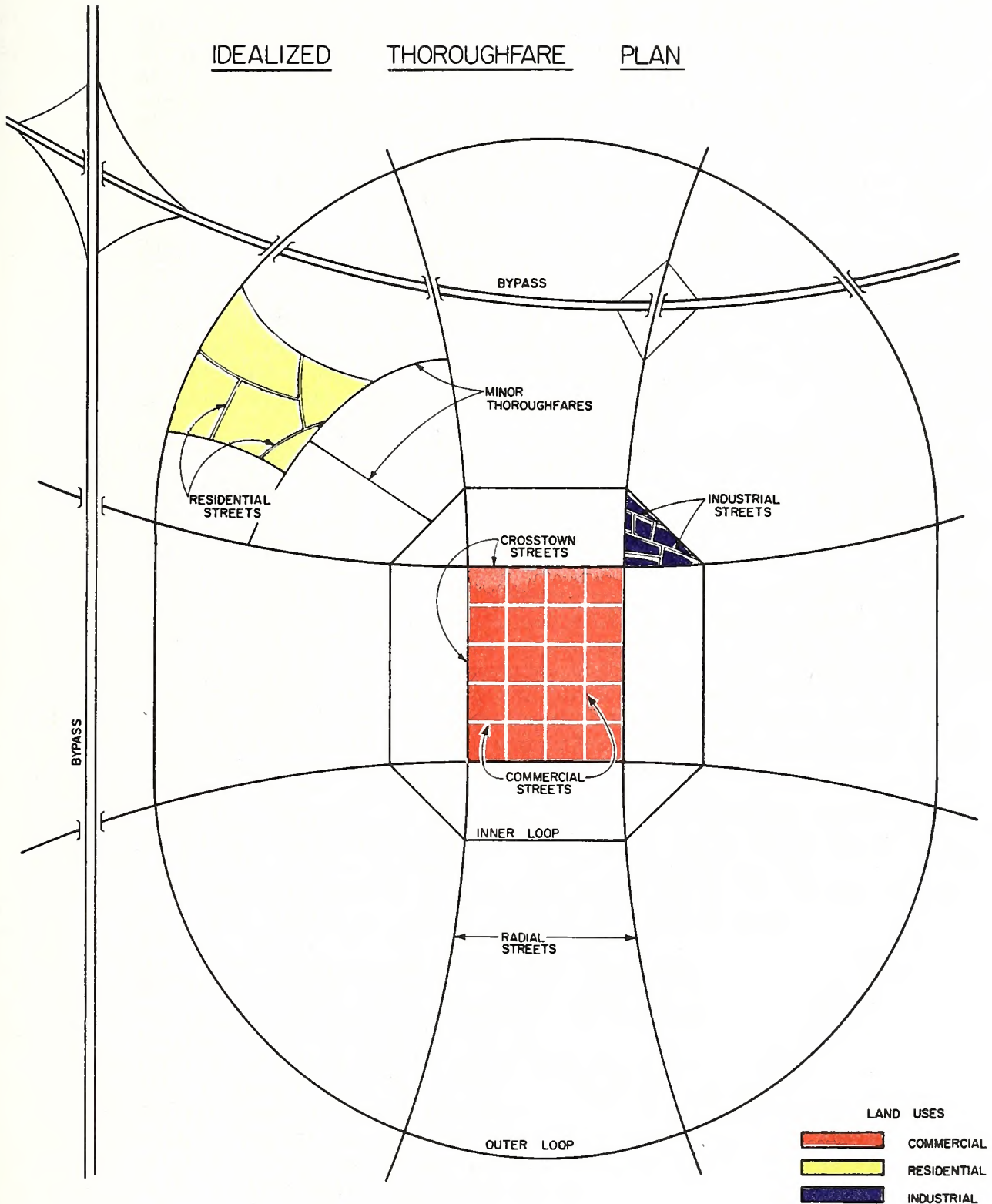


Figure 2 gives a schematic illustration of a functionally classified rural highway system. A description of the system elements follows.

Rural Principal Arterial System: The rural principal arterial system consists of a connected network of continuous routes which serve corridor movements having trip lengths and travel density characteristics indicative of substantial statewide or interstate travel. The principal arterial system should serve all urban areas of over 50,000 population and a large majority of those with a population greater than 5000. The Interstate System constitutes a significant portion of the principal arterial system.

Rural Minor Arterial System: The minor arterial system in conjunction with the principal arterial system forms a network which links cities, larger towns, and other major traffic generators such as large resorts. The minor arterial system generally serves interstate and intercounty travel and serves travel corridors with trip lengths and travel densities somewhat less than the principal arterial system.

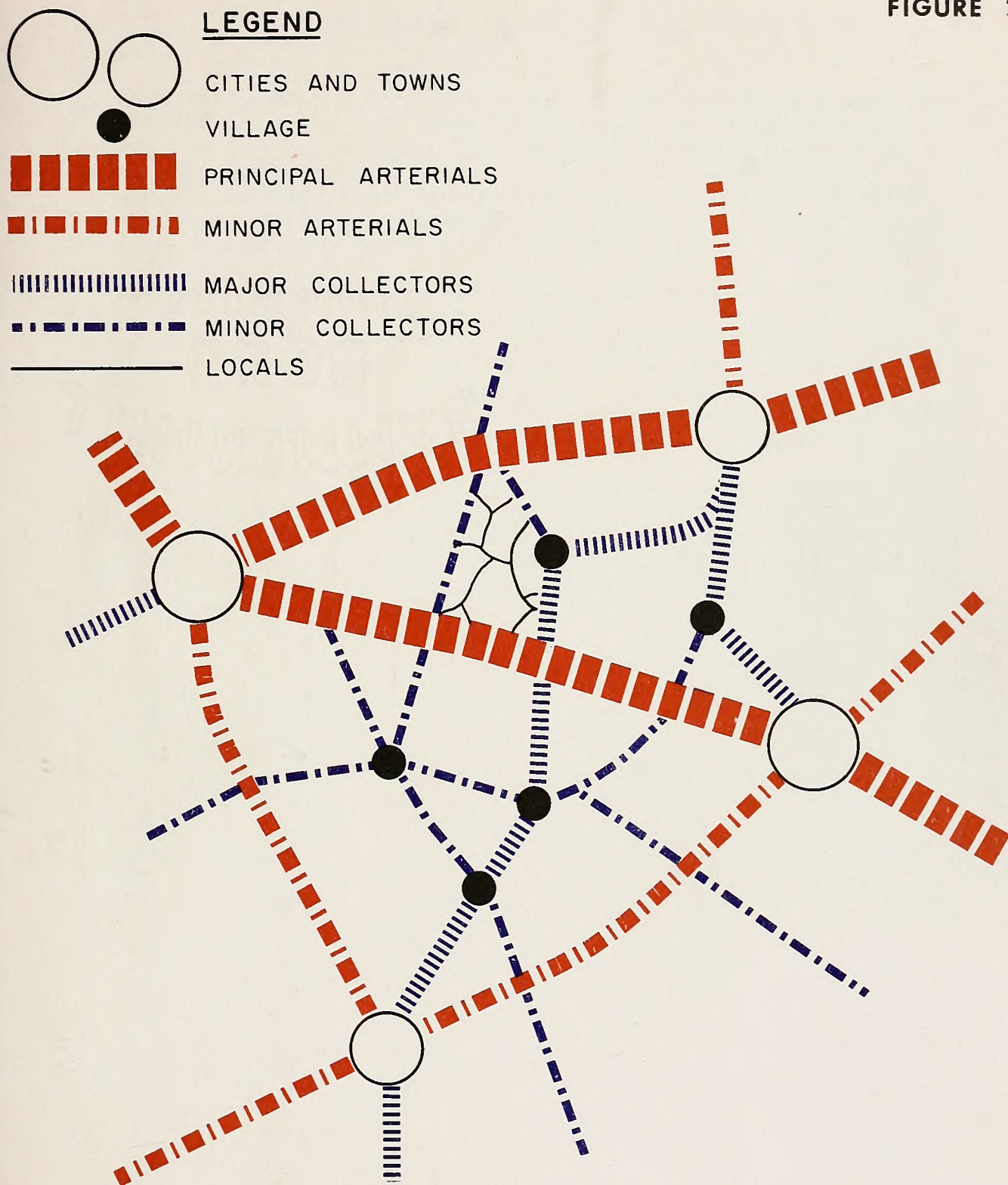
Rural Collector Road System: The rural collector routes generally serve intracounty travel rather than statewide travel and constitute those routes on which the predominant travel distances are shorter than on the arterial routes. This system is subclassified into major collector roads and minor collector roads.

Major Collector Roads: These routes (1) provide service to the larger towns not directly served by the higher systems and to other traffic generators of equivalent intracounty importance, such as consolidated schools, shipping points, county parks, important mining and agricultural areas, etc., (2) link these places with nearby larger towns or cities, or with routes of higher classification., and (3) serve the more important intracounty travel corridors.

Minor Collector Roads: These routes (1) collect traffic from local roads and bring all developed areas within a reasonable distance of a collector road., (2) provide service to the remaining smaller communities; and (3) link the locally important traffic generators with their rural hinterland.

Rural Local Road System: The local roads comprise all roads not on one of the higher systems. Local residential subdivision streets and residential collector streets are elements of the local road system. Local residential streets are either cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares or serve major traffic generators and do not collect traffic from more than one hundred dwelling units. Residential collector streets are streets which serve as the connecting street system between local residential streets and the thoroughfare system .

FIGURE 2



SCHEMATIC ILLUSTRATION
OF FUNCTIONALLY CLASSIFIED
RURAL HIGHWAY NETWORK

III. URBAN THOROUGHFARE PLANS IN MOORE COUNTY

Portions of Moore County have already been subjected to thoroughfare planning efforts and as such have been excluded from the planning efforts described in this report, except for purposes of providing for system continuity as described previously. A plan for Southern Pines and Aberdeen was adopted by both town governments and by the state Board of Transportation in 1977. Carthage also has an adopted plan, last updated in 1975. Each of these plans is included in this report in Appendix A.

The growth which has occurred in Southern Pines and Aberdeen since the current thoroughfare plan was adopted has led local officials to request that the plan be revised to reflect current and expected future conditions. There is growing concern that the development now occurring in the US 1 and US 15/501 corridors, which is not reflected in the current plan, may preclude needed system improvements if not addressed in the near future. A new study is scheduled for 1987 and 1988.

In addition, the Pinehurst area, now incorporated and growing at a rapid rate, has become sufficiently developed such that an analysis of its thoroughfare needs is beyond the scope of this study. The town has requested thoroughfare planning assistance from the Department, and a plan for the town will be developed as part of an updating of the Southern Pines-Aberdeen area plan.

IV. EXISTING AND PROJECTED CONDITIONS

The objective of the thoroughfare planning process is the development of a roadway system which will allow for the safe, efficient movement of people and goods. To determine the transportation needs of the county, its geography, population trends, land use, condition and effectiveness of the existing roadway network, and related traffic growth must be examined. Not only must there be an understanding of existing conditions and their relationship to existing traffic, but future social and economic conditions must be projected, to provide information needed to estimate future traffic levels.

In this chapter, those factors which most strongly influence the effectiveness of the county's road network will be examined, to provide a measure of current and future demand on the network. The network itself will be evaluated to identify deficiencies which should be addressed by system improvements and areas where safety problems exist will be identified.

Moore County is a predominantly rural county located in the south central part of the state known as the Sandhills.¹ Its location is shown in Figure 3. With a population in 1985 of 54,700¹, it is the state's thirty-eighth most populous county. Only 24% of the population resides in urban areas, primarily Southern Pines, Aberdeen, and Pinehurst.

While it remains predominantly rural, Moore County has established a national reputation as a golfing mecca, with a reputation that has been parlayed into a thriving tourist industry. In 1984, tourism generated \$172 million for the local economy ranking the county seventh in the state and employing over 2200 people. It has been estimated that 350,000 visitors traveled to Moore County in 1984, with 75% of those coming from outside of the state.

The other principal economic activity of the county is manufacturing. In 1984, over 5900 people were employed by 97 manufacturing companies, with a payroll of over \$80 million. Most of the firms, primarily related to textile or furniture production, are located in the US 1 corridor or along NC 211 west of Pinehurst.

US 1 is the primary transportation corridor for the county, serving the county from the north and south. The other principal roadway serving the Southern Pines-Pinehurst area is NC 211 from the west. NC 24-27 provides for cross-county travel in the north.

Running parallel to US 1 is the mainline of the Seaboard System Railroad, which provides rail freight service to Southern Pines and Aberdeen. Aberdeen is also home to two short line railroad companies. The Aberdeen and Rockfish provides service to Fayetteville, while the Aberdeen and Briarpatch serves shippers in western Moore County and eastern Montgomery County. Rail passenger service is provided by Amtrak at a stop in Southern Pines, with service northward to Raleigh and south to Columbia.

¹Office of State Budget, N. C. Department of Administration, July 1985.

There is at the present time no scheduled air service to Moore County. Such service has been provided in the past, but the Moore County Airport is now used only for private operations.

Population

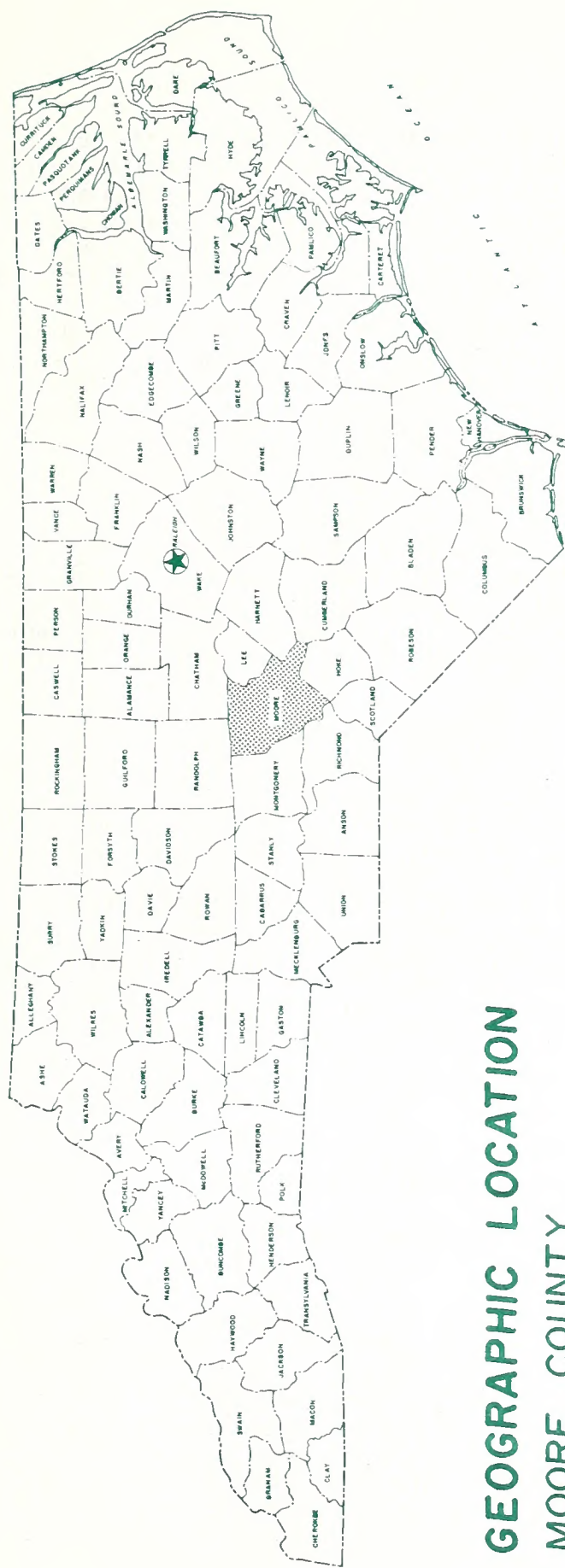
The volume of traffic on a section of roadway is a function of the magnitude and location of the population it serves. An analysis of population is one of the first steps the transportation planner takes. An analysis of past trends allows the planner to estimate future population and the traffic which it will generate with some degree of reliability.

The 1980 population of Moore County was 50,505. This represents an increase of 29.3 percent over the 1970 population, a quite substantial rate of growth. A majority of the population is contained in the three southern townships of Mineral Springs, McNeills, and Sandhills, and most of the recent population growth has occurred there as well.

The state's office of State Budget has estimated the 1985 population to be 54,700, a figure which reflects a slowing but still healthy rate of growth (at 1.6% per year) in the past five years. Population has been projected to reach 71,350 by the year 2005. Table 2 gives population growth trends and projections. Township projections are based on the assumption that the relative growth of the various townships will continue as it has recently, that Mineral Springs, McNeills, and Sandhills will experience the greatest growth.

TABLE 2						
Moore County Population						
Township	Population Trends			Population Projections ¹		
	1960	1970	1980	1990	2000	2005
Carthage	4788	4640	5241	5880	6388	6584
Bensalem	2565	2903	2725	2725	2725	2725
Sheffields	4418	4607	5468	6468	7244	7849
Ritters	2000	2056	2273	2387	2518	2669
Deep River	426	357	348	350	350	350
Greenwood	2058	1934	2175	2262	2352	2447
McNeills	8895	10,221	13,960	16,326	18,463	20,114
Sandhill	5476	6442	9240	11,114	12,607	13,742
Mineral Springs	5419	5092	8007	9996	11,696	12,895
Little River	688	796	1068	1294	1515	1712
County Total	36,733	39,048	50,505	58,802	65,853	71,354
County Annual Growth Rate	-	0.6%	2.6%	1.5%	1.1%	1.6%

¹County projections from Office of State Budget; township projections by NCDOT.



GEOGRAPHIC LOCATION MOORE COUNTY

MOORE COUNTY IS LOCATED IN THE SOUTHERN PIEDMONT SECTION OF NORTH CAROLINA. WITH MONTGOMERY COUNTY ON ITS WESTERN BOUNDARY, IT IS BORDERED CLOCKWISE BY RANDOLPH, CHATHAM, LEE, HARNETT, CUMBERLAND, HOKE, AND RICHMOND COUNTIES.

Land Use

Just as population is concentrated in the southern portion of the county, primarily in the Southern Pines-Aberdeen-Pinehurst area so, too, are the major commercial, industrial, and tourist-related land-uses. Indeed, much of this activity is within the Southern Pines-Aberdeen-Pinehurst planning area, which has been excluded from this study in favor of the urban area plan which will follow this one.

Outside of the Southern Pines-Aberdeen-Pinehurst area, much of the current development is taking place along NC 211 west of Pinehurst. Several industries are located in this area, as is the residential community of Seven Lakes.

Existing Road System

In a manner consistent with the principals described in the second section of this report, each segment of the rural road network in Moore County has been assigned a functional classification. An arterial highway system has been identified which consists of the principal regional traffic movers. This system includes the following:

US 1
US 15/501 south of Aberdeen
NC 24/27

These routes function as the main traffic-carrying arteries leading to and from the county and also serve through traffic.

In addition to the arterials, roads have been classified as either major or minor collectors or local roads. A breakdown of the mileage of each rural classification is as follows:

principal arterials	13 miles
minor arterials	35 miles
major collectors	183 miles
minor collectors	140 miles
local roads	<u>798 miles</u>

Total rural mileage	1168 miles
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In the recommendations section of this report, these classifications are more fully identified.

Traffic and Level of Service

An effective county road network is able to serve travel demand safely, without congestion, and with efficiency of movement. In this and the following sections, the effectiveness of the Moore County thoroughfare system will be examined, in terms of its traffic handling capacity and absence of congestion, its system efficiency, and its safety both

currently and with traffic volumes expected by the year 2005. The findings of this examination will be the basis for the recommendations contained in the following chapter.

The ability of a section of roadway to move traffic is controlled principally by the spacing of major intersections and the amount of other side interference, the width of the pavement, and the traffic control devices used. As traffic volumes increase, improvements may be needed in pavement width and in traffic control to ease congestion problems and to maintain reasonable speed. For any section of roadway, increasing volumes naturally lead to increased congestion and reduced speed. In analyzing existing and future traffic and congestion, a decision must be made regarding the amount of congestion that can reasonably be tolerated, a measure known as level of service.

In general, more congestion can be tolerated in urban areas, where density of development does not call for maintenance of high operating speeds. Lesser levels of congestion are tolerated in rural areas, where longer travel distances make higher speeds desirable to reduce travel time. However, economic realities must also be considered, since higher levels of service dictate better, more expensive roadways.

In analyzing the Moore County road system, it was decided to differentiate between the level of service expected on major arterials and that acceptable on other roadways.¹ For the arterial highways, a level of service technically referred to as level C has been selected, providing stable flow with operating speeds of at least 51 mph and some freedom to select lanes and pass slower traffic. On other roadways, level of service D, described as providing stable flow but with speed and maneuverability more closely controlled by higher volumes, has been selected. Level D is considered to provide relatively satisfactory operating conditions. It should be noted that, with the peaking of travel along most roadways occurring during morning and evening "rush hours" the conditions described by levels of service C or D are worst case situations and are of limited duration. For all but those few hours, traffic on nearly all roads would be expected to flow smoothly and rapidly.

¹Based on definitions contained in 1985 Highway Capacity Manual, which establishes the following relationship for two lane rural highways in rolling terrain.

<u>Level of Service</u>	<u>Volume/Capacity Ratio</u>	<u>Speed (mph)</u>
C	.35	51
D	.52	49
E (Capacity)	.91	40

An evaluation of the existing rural roadway system was made to determine the volumes of traffic which could be handled at the specified levels of service. This service volume was then compared to existing and projected traffic volumes to identify sections where unacceptable congestion could be expected. In 1985, one major segment of roadway was identified as operating below the desired level. This was the two lane section of US 1 north of Southern Pines.

To determine traffic levels that might be expected on the major road system by the year 2005, existing traffic levels were projected using past trends, with adjustments made within those areas where accelerated growth is expected. This design year (2005) traffic was then compared to the existing service volume of each roadway. As is illustrated in Figure 4, several service deficiencies can be expected to develop within Moore County by 2005 if significant roadway improvements are not made.

System Efficiency

The efficiency with which the road system allows directness of movement is a second measure of that system's adequacy. Ideally, the system should allow ready access to major activity centers in the south, and smooth flow of intra-county traffic. Particularly in the case of arterials or major collectors, indirect or overlapping routing is undesirable. Several shortcomings in this efficiency are seen within the county, primarily in areas where two or more routes overlap, forcing north-south and east-west traffic to use the same facility, or where the two legs of one roadway are offset at its intersection with another highway. An example of this inefficiency of the intersection of NC 73 with NC 211 in West End, where NC 73 is offset.

On a large scale, the development of separate government and commercial centers, in Carthage and Southern Pines, respectively, has not been fully accommodated by the road system. Carthage is centrally located, and is readily accessible from most of the county. However, access to the Southern Pines area seems somewhat indirect from the northeast and the more developed northwest corners of the county.

In addition, travel across the north portion of the county, using SR 1002 to Robbins, SR 1470 to High Falls, and SR 1600 into Chatham County, must divert for 1.5 miles onto NC 22 to cross the Deep River. Direct routing would be preferable.

On a smaller scale, there are numerous cases where signing and intersection alignment serve to give preference to movement along local or minor collector roads at the expense of major collector or arterial routes. Similarly, as mentioned above, offset intersections have the effect of reducing efficiency by forcing multiple turning movements rather than allowing a single crossing move. In considering needed improvements to the county's roads, attention should be given to these situations, in order to give priority to movements on roads of higher functional class.

Bridge Conditions

Bridges are a vital and unique element of a highway system. They represent the highest unit investment of all elements of the system, and any inadequacy or deficiency in a bridge reduces the value of the total investment. A bridge presents the greatest opportunity of all potential highway failures for disruption of community welfare, and most importantly, a bridge represents the greatest opportunity of all highway failures for loss of life. For these reasons, it is imperative that bridges be constructed to the same design standards as the highway system of which they are a part.

The United States Congress enacted the National Bridge Inspection Program Standards on April 27, 1971, implementing the Federal Highway Act of 1968. These standards require that "all structures defined as bridges located on and of the Federal-Aid Highway Systems be inspected and the safe load carrying capacity computed at regular intervals, not to exceed two years." A sufficiency index number has been calculated for each bridge for the purpose of establishing eligibility and priority for replacement. The bridges with the highest priority are replaced as Federal-Aid funds and State funds are made available. Additional funds have recently been provided by Congress specifically for bridge replacement.

In conformance with federal requirements, all bridges in Moore County have been inspected and rated, with a bridge sufficiency rating developed for each. This rating, which can range from 0 to 100%, is based on three factors: structural adequacy and safety, serviceability and functional obsolescence, and essentiality for public use. A bridge with sufficiency rating of 50 percent or less is eligible for federal bridge replacement funding. Finally, eligible bridges are classified as either structurally deficient or functionally obsolete. Generally, structurally deficient bridges are given replacement priority.

In Moore County, 53 bridges have sufficiency ratings lower than 50 percent, and are thus eligible for replacement funding. Of these, 39 have been designated as being structurally deficient and 14 have been found to be functionally obsolete. Table 3 lists the worst of the deficient bridges, those with ratings below 35 percent, and indicates those now programmed for replacement. Table 4 lists the functionally obsolete bridges with ratings below 50 percent. The locations of these bridges is shown in Figure 5.

FIGURE 4



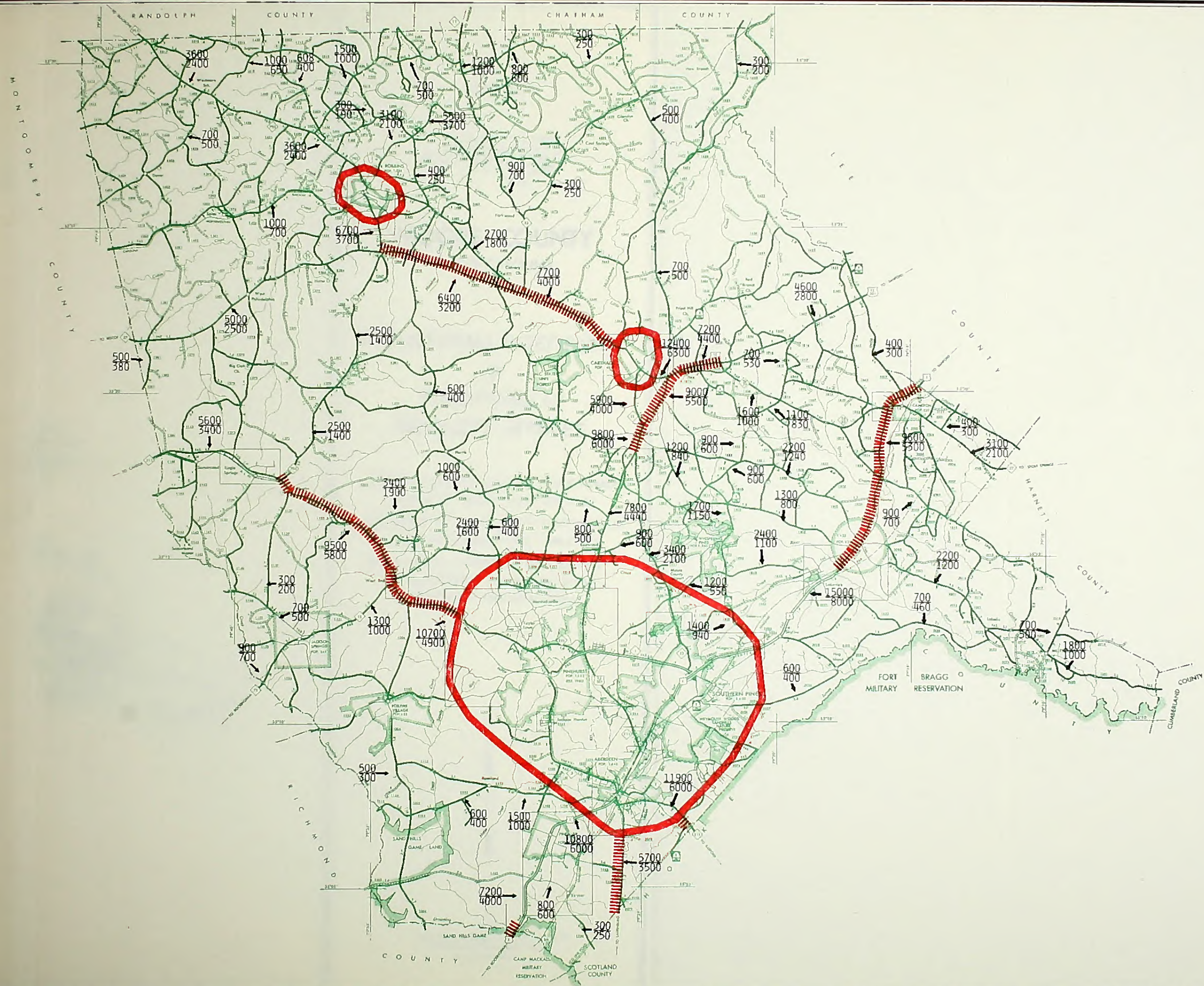
MOORE COUNTY
NORTH CAROLINA

**PROJECTED
HIGHWAY SYSTEM
DEFICIENCIES**

LEGEND

YEAR	ADT
2005	0000
1985	0000

- ||||| ANTICIPATED SERVICE DEFICIENCIES
- PLANNING AREA BOUNDARY



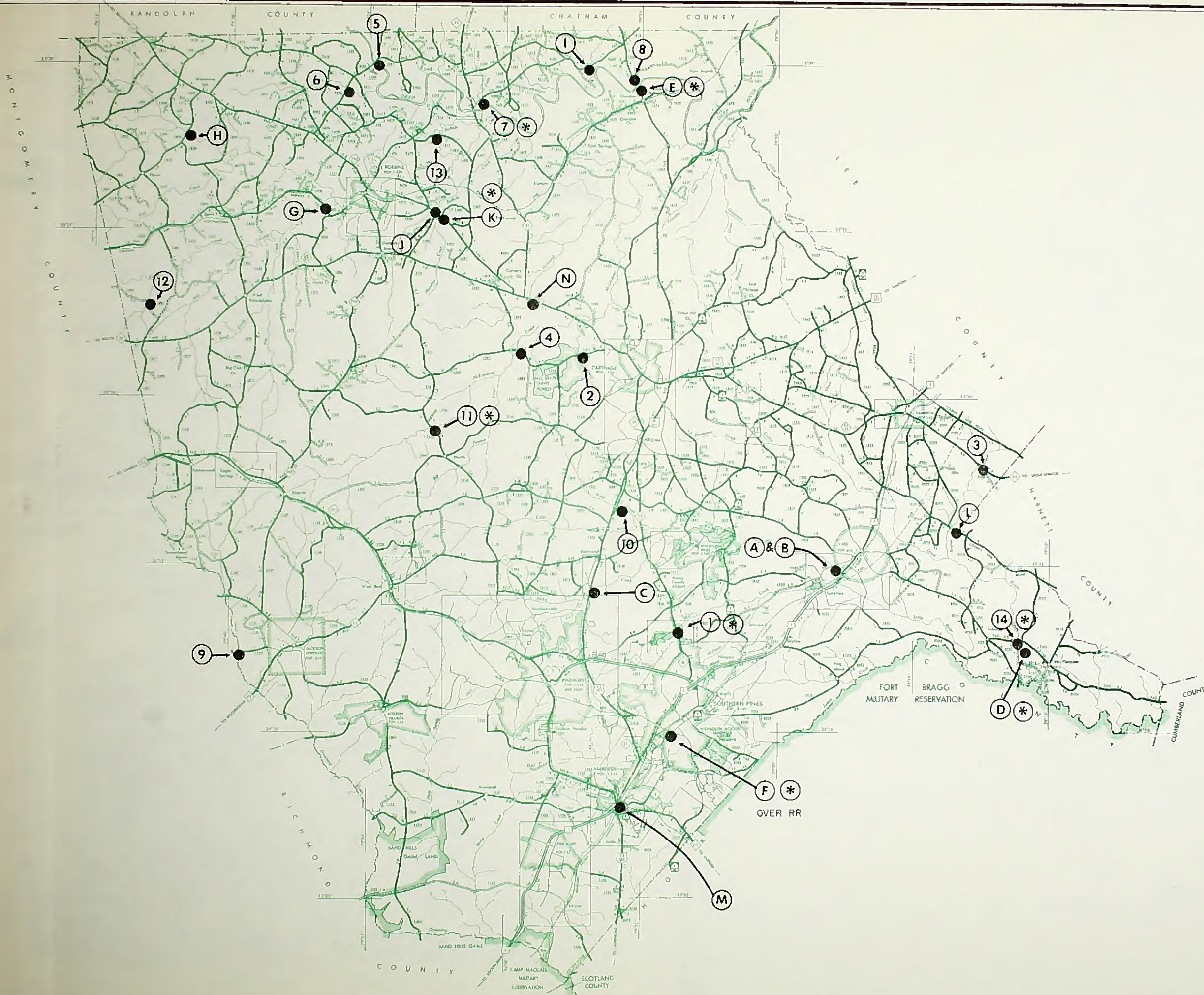


FIGURE 5



MOORE COUNTY NORTH CAROLINA

STRUCTURALLY DEFICIENT & FUNCTIONALLY OBSOLETE BRIDGES

- ① INDICATES LOCATION OF STRUCTURALLY DEFICIENT BRIDGE (SEE TABLE 3)
- A INDICATES LOCATION OF FUNCTIONALLY OBSOLETE BRIDGE (SEE TABLE 5)
- * INDICATES BRIDGE SCHEDULED FOR REPLACEMENT (TRANSPORTATION IMPROVEMENT PROGRAM, 1985)



Table 3

Structurally Deficient Bridges in Moore County
With Sufficiency Ratings Less than 35%
or Programmed for Improvement

<u>Map Index(1)</u>	<u>Location</u>	<u>Bridge No.</u>	<u>Sufficiency Rating</u>	<u>Program Status(2)</u>
1	NC 22 @ Mill Creek	10	7.0	X
2	SR 1261 @ Killets Creek	66	16.8	
3	NC 24/27 @ Beaver Creek	73	18.8	
4	SR 1261 @ McClendons Creek	68	20.3	
5	SR 1456 @ Deep River	82	22.3	
6	SR 1456 @ Old Ford Creek	78	23.6	
7	SR 1606 @ Falls Creek	168	24.2	X
8	SR 1619 @ Trib. of Deep River	51	24.4	
9	SR 1122 @ Drowning Creek	115	28.6	
10	SR 1835 @ Wads Creek	190	28.8	
11	SR 1210 @ McClendons Creek	99	33.0	X
12	SR 1400 @ Branch of Cabin Cr	96	33.8	
13	SR 1484 @ Buffalo Creek	178	34.0	
14	SR 1001 @ Crains Creek	194	41.3	X

(1) Refers to Figure 5.

(2) Projects noted by "X" are scheduled for replacement under the Transportation Improvement Program, 1987-1995 (December, 1986).

TABLE 4

Functionally Obsolete Bridges in Moore County
With Sufficiency Ratings less than 50%
or Programmed For Improvement

<u>Map Index(1)</u>	<u>Location</u>	<u>Bridge No.</u>	<u>Sufficiency Rating</u>	<u>Program Status(2)</u>
A	SR 1861 @ Little River	149	19.7	
B	SR 1861 @ Little River	150	20.9	
C	SR 1285 @ Nicks Creek	185	21.0	
D	SR 2017 @ Crains Creek	195	27.5	X
E	SR 1006 @ Deep River	52	32.4	X
F	SR 2080 @ Seaboard Sys. RR	210	32.5	X
G	SR 1002 @ Cabin Creek	89	39.1	
H	SR 1405 @ Bear Creek	92	41.5	
I	SR 1600 @ Tysons Creek	53	43.9	
J	SR 1477 @ Buffalo Creek	71	45.7	
K	SR 1477 @ Meadow Creek	70	45.9	X
L	SR 1825 @ Beaver Creek	6	47.2	
M	NC 5 @ Aberdeen Creek	3	48.2	
N	NC 22 @ Richland Creek	54	48.8	

(1) Refers to Figure 5.

(2) Projects Noted by "X" are scheduled for replacement under the Transportation Improvement Program, 1987-1995 (December 1986).

Traffic Safety

Traffic accident records have been examined to locate problem areas on the highway system. The records for January, 1982 through November, 1985 were studied to determine the intersections experiencing the highest accident rates. The intersections outside the Southern Pines-Aberdeen-Pinehurst planning areas that had 10 or more accidents or a high accident severity during this period are listed in Table 5. The traffic circle on US 15/501 at Pinehurst is included in the list because it represents the highest accident location in the county. However, the severity of the accidents there is relatively low, indicating that accidents are primarily property damage only.

In addition to high accident intersections, extended narrow sections of roadway are considered to be significantly more dangerous than are those sections meeting or approaching current design standards, especially when significant traffic volumes result in increasing friction with oncoming traffic. For all road sections which are included on the thoroughfare plan roadway width has been examined for adequacy. No sections were found to have 16 foot or 17 foot wide pavement, which would be seriously deficient.

Table 5		
Frequent Accident Locations in Moore County 1982-1985		
<u>Location</u>	<u>Number of Accidents</u>	<u>Severity Index (1)</u>
Pinehurst traffic circle (US 15/501-NC 211-NC 2)	24	6.31
US 15/501-NC 22	10	20.84
NC 22-SR 1843 (Moore Co. Airport)	11	19.04
NC 24 - NC 705	15	12.44
NC 211 - NC 73 (West End)	14	8.76
SR 1802 - SR 1803 (South of Carthage)	7	26.76
NC 24 - SR 1006 (East of Carthage)	8	25.80

- (1) Severity index provided a relative measure of the severity of accidents at a given location. Accidents resulting in property damage only have an index rating of 1.00; fatal accidents and severe injury accidents, 64.0.

Sections with 18 foot pavement are generally thought to be marginally acceptable at low volumes. No sections of 18 foot roadway currently have volumes exceeding 3000 vehicles per day, and only SR 1477 east of Robbins is expected to have traffic exceeding that level.

Finally, it is noted that US 15/501 between US 1 in Aberdeen and Carthage has eight other intersections which have experienced 5-10 accidents during the study period. While it is mostly a 24-foot roadway, side conflicts and traffic volume appear to be reducing safety substantially.

V. RECOMMENDED THOROUGHFARE PLAN

The plan detailed in this report is designed to provide adequate travel service to the county through the current planning period. It addresses not only the projected capacity deficiencies, but also system deficiencies where necessary. The goal is to provide an integrated future highway system that will enable regional travel to progress rapidly, and a secondary system of roads that will provide efficient, safe travel to all local areas.

Figure 8 shows the functionally classified existing and future county/thoroughfare system recommended for Moore County. Only the obvious major connections are shown in the developed area of Southern Pines-Aberdeen-Pinehurst. Elements of the Moore County Plan are described below. Details on the recommended improvements for roads on the thoroughfare plan are contained in Appendix B, Thoroughfare Plan Street Tabulations and Recommendations.

The functional classification recommended in Figure 8 includes several changes from the classification presently in place. The changes are intended to improve the logic of the classification and to define a system more in line with the current and expected functioning of various roads and highways. The following classification changes are recommended:

- SR 2023 (Pheasant Road), from SR 1853 to SR 2022, from local street to minor collector, to provide a continuous minor collector route into Southern Pines from the east;
- SR 1210 (Taylortown Road), from NC 24/27 south to SR 1261, from local to minor collector, to create a continuous collector route between Pinehurst and NC 24/27;
- SR 1868 (Old Pee Dee Road) from SR 1803 to SR 1831, from local to minor collector, to provide a continuous minor collector route between Southern Pines and US 15/501.
- SR 1838 (McCaskill Road), from US 15/501 to SR 1831, and SR 1831 (Farm Life School Road) from SR 1838 to SR 1803, from local to minor collector, to extend the NC 73 corridor and to provide collector service to the school on SR 1831;
- SR 1470 (High Falls Road) from Robbins to NC 22, from minor to major collector; for continuity with SR 1002 from west and to recognize service to the high school on SR 1470;
- SR 1456 (Howard Mill Road) and SR 1461 (N. Howard Mill), from NC 705 to NC 22, from major to minor collector, corresponding to recommended change of SR 1470;
- SR 1137 (Harrison Road) from NC 211 to NC 73, from major to minor collector; road serves little traffic, and the southwest quadrant circumferential service is provided by NC 211.

It is recommended that several types of improvements to the thoroughfare system be pursued. First, capacity improvements should be made to avoid undesirable levels of peak hour congestion during the design period. It is recommended that level of service C be provided on the arterial road system. All collectors should be improved as needed to provide level of service D. While the existing system generally should provide adequate service to the design year, some sections will require widening.

In order to improve system efficiency, it is recommended that several connecting routes or bypasses be constructed. Principal among these are a bypass of Carthage on NC 24/27 and the relocation of US 1 around Vass and Cameron. Also, minor realignment of several inter-sections should be considered. These are described in Table 6.

Numerous safety related improvements are needed. Structurally and functionally obsolete bridges, as identified in the previous chapter, should be replaced. Traffic engineering improvements should be applied to relieve those high accident locations. A particular focus of attention in this regard should be on those off-set intersections that are experiencing high number of accidents. Finally it is recommended that narrow sections of roadway be widened, especially where these roads serve as school bus routes. Sections 18 feet wide and carrying over 4000 vehicles per day should also be widened. Applicable roadways are delineated in Appendix B.

Arterial System

The county arterial system is comprised of principal arterial highways and minor arterial roadways. The principal arterials serve as the primary routes for moving traffic into, out of, and through Moore County. The minor arterials supplement the principal system, linking towns and other major traffic generators. The recommended arterial system is listed in Table 7, along with general statements of needed improvements.

Collector Road System

The rural collector routes serve primarily intra-county travel. The major collector roads supplement the arterial system by providing an interconnecting network between smaller population centers and the arterial system. The minor collector roads collect traffic from the local roads and carry it to a higher system facility. Major and minor collector roads of Moore County are listed in Tables 8 and 9.

FIGURE 6

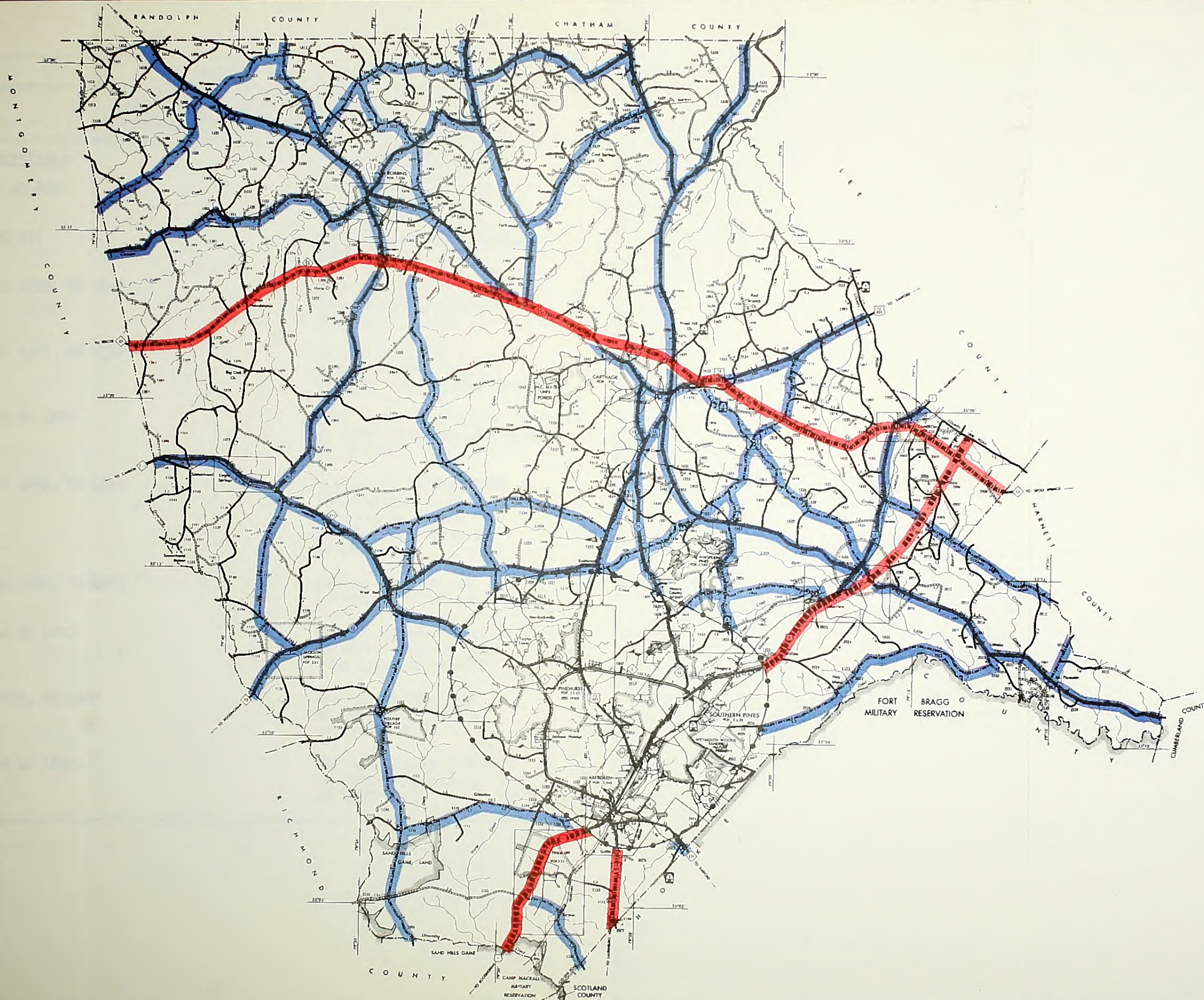


MOORE COUNTY

NORTH CAROLINA

RECOMMENDED THOROUGHFARE PLAN

NOTE: RECOMMENDATIONS DEAL EXCLUSIVELY WITH AREAS OUTSIDE OF SOUTHERN PINES-ABERDEEN-PINEHURST URBAN AREA.



LEGEND	EXISTING	PROPOSED
PRINCIPAL ARTERIALS		
MINOR ARTERIALS		
MAJOR COLLECTORS		
MINOR COLLECTORS		
URBAN MAJOR THOROUGHFARE		
URBAN THOROUGHFARE		
PLANNING AREA BOUNDARY		

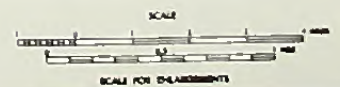


TABLE 6

INTERSECTIONS RECOMMENDED
FOR REALIGNMENT OR RESIGNING

<u>Intersection</u>	<u>Recommended Change</u>
NC 211 and NC 705	Realign NC 705 and SR 1137 to eliminate offset
NC 73 at NC 211	Realign NC 73 to eliminate offset
SR 1229, SR 1239, SR 1240	Give priority to travel from SR 1229 on east to SR 1239
SR 1229, SR 1227, SR 1224	Give priority to travel from SR 1229 on west to SR 1227, then to SR 1224
SR 1831 and SR 1838	Give priority to travel from SR 1838 eastbound continuing to SR 1831
SR 1802, SR 1803, SR 1868	Realign SR 1802/SR 1868 intersection to give priority to travel from SR 1802 from south to SR 1868.
SR 1805, SR 1809, SR 1832	Realign SR 1809 and SR 1832 to eliminate offset
SR 2026 and SR 2023	Realign to give priority to travel from SR 2026 from south to SR 2023.
US 1, SR 1001, SR 1803	Realign SR 1001 and SR 1803 to eliminate offset at US 1
SR 1002 and SR 1434	Realign to give priority to through travel on SR 1002.

On the major collector system, widenings are recommended for several segments. US 15/501 between Southern Pines and Carthage will require widening to 5 lanes as will NC 211 between Pinehurst and West End. NC 211 south of Aberdeen and between West End and NC 705 will need a four lane section, and NC 705 south of Robbins needs minor widening. Reference to Appendix B will indicate sections needing improvement.

Table 7	
Recommended Arterial System Moore County	
<u>Other Principal Arterials</u>	<u>Improvements</u>
US 1	Replace existing 2 lane section with 4 lanes
US 15/501 South from Aberdeen	None required
<u>Minor Arterials</u>	
NC 24/27: Montgomery to Harnett County	Widen part to 4 lanes with bypass at Carthage

Table 8	
Recommended Major Collector System Moore County	
NC 211	Aberdeen to Hoke County
NC 211	Pinehurst to Montgomery County
US 15/501	Southern Pines to Carthage and NC 24/27 to Lee County
NC 22	Southern Pines to Carthage and NC 24/27 to Chatham County
NC 73	Pinehurst Planning Area to Montgomery County
NC 705	Randolph County at NC 211
SR 1002-Robbins Rd.	Montgomery County to Robbins
SR 1477-Plant Rd.	Robbins to NC 24/27
SR 1470-Highfalls Rd.	Robbins to NC 22
SR 1600-Wilson Rd.	NC 22 to SR 1006 (River Rd.)
SR 1006-River Rd.	Carthage to Chatham County
SR 1621-Carbonton Rd.	SR 1006 (River Rd.) to Chatham County
SR 1803-Clay Farm Rd.	US 15/501 to Vass
SR 1001-Lobelvia Rd.	Vass to Cumberland County

TABLE 9

Recommended Minor Collector System
Moore County

SR 1004-West End Rd.	NC 211 to Richmond County
SR 1137-Harrison Rd.	Jackson Springs to NC 211
SR 1210-Taylortown Rd.	Pinehurst to NC 24/27
SR 1239-Sleepy Hollow Rd.	NC 211 to SR 1229 (West End Rd.)
SR 1229-West End Rd.	SR 1239 (Sleepy Hollow Rd.) to SR 1227 (Kano Rd.)
SR 1227-Kano Rd.	SR 1229 (West End Rd.) to SR 1224 (Doubs Chapel Rd.)
SR 1224-Doubs Chapel Rd.	SR 1227 (Kane Rd.) to US 15/501
SR 1281-Tarry Rd.	NC 24/27 to Montgomery County
SR 1405-Bover Church Rd.	Montgomery County to NC 705 (Westmore School)
SR 1419-Reynolds Mill Rd.	NC 705 (Westmore School) to SR 1003 (Needham Grove Rd.)
SR 1003-Needham Grove Rd.	SR 1419 (Reynolds Mill Rd.) to NC 705
SR 1456-Howard Mill Rd.	NC 705 to SR 1461 (N. Howard Mill Rd.)
SR 1461-N. Howard Mill Rd.	SR 1456 (Howard Mill Rd.) to NC 22
SR 1419-Reynolds Mill Rd.	SR 1456 (Howard Mill Rd.) to SR 1460 (Ritter Rd.)
SR 1479-Lake Siding Road	SR 1460 (Ritter Rd) to SR 1477 (Plank Rd.)
SR 1629-Puttman Dr.	NC 22 to SR 1006 (River Rd.)
SR 1838-McCaskill Rd.	NC 22 to SR 1831 (Farm Life School Rd.)
SR 1831-Farm Life School Rd.	SR 1838 (McCaskill Rd.) to SR 1832 (Briggs Rd.)
SR 1832-Briggs Rd.	SR 1831 (Farm Life School) to SR 1805 (Union Church Rd.)
SR 1809-Grady Rd.	SR 1805 (Union Church Rd.) to NC 24/27
SR 1815-Thomas Rd.	NC 24/27 to US 15/501

VI. IMPROVEMENT PRIORITIES

The improvements to the Moore County thoroughfare system which were recommended in the last chapter obviously cannot be undertaken all at once, nor should they be. The availability of funding precludes this, and the need for many of the improvements is not immediate. In an effort to reflect fiscal realities and the relative value of various improvements, an assessment has been made of the benefits which can be expected and a comparison has been made to project costs. The result of this benefit-cost analysis is the development of a listing of priorities for those recommended improvements.

Priorities have been set by comparing the benefits which might result and expected project costs. Three principal measures of the benefits have been used. These are road user cost savings, the potential for increased economic development resulting from the improvement, and the environmental impact, either positive or negative, which might result. The first measure is an actual estimate of dollar savings, while the others are estimates of the probability of resulting change.

Reduced road user costs should result from any roadway improvement, whether a simple widening or construction of a new roadway to relieve congested or unsafe conditions. Comparisons for both existing and proposed facility have been made in terms of vehicle operating costs, travel time costs, and accident costs. These user benefits are computed as total dollar savings over the 20 year design period using data such as project length, base year and design year traffic volumes, traffic speed, type of facility, and volume/capacity ratio.

The impact of a project on economic development potential is the probability that it will stimulate economic development of an area by providing access to developable land and reducing transportation costs. It is a subjective estimate based on knowledge of the proposed project, local development characteristics, and land development potential. Probability is rated on a decimal scale of 0 (none) to 1.0 (excellent).

The environmental impact analysis considers the effect of a project on the physical and social/cultural environment. In considering impact on the physical environment, the following items have been considered: air quality, water resources, soils and geology, wildlife, and vegetation. impacts on neighborhoods, educational facilities, churches, parks and recreational facilities, historic sites and landmarks, public health and safety, aesthetics, and noise are the social/cultural considerations. The environmental impact potential is rated on the same scale as the economic impact potential except that negative and positive impacts are rated separately.

Off-setting the benefits which would be derived from any project is the cost of its construction. A new facility, despite its high projected benefits, might prove unjustified due to excessive cost of construction. The highway costs estimated in this report are based on average statewide construction costs for typical project types and also include consideration of expected right-of-way costs.

Project Priorities

To guide both the state and the county in their efforts to implement the improvements recommended in this report, the needed improvements have been placed into priority groups based on the benefit-cost analyses. High, medium and low priority groupings are suggested. Recommended high and medium priority projects are listed in Table 10, along with the result of the analyses. Other roadway improvements, which can be identified from Appendix B, are considered to be low priority projects.

TABLE 10

Thoroughfare System Improvement Priorities

Project	Benefits Evaluation Matrix					Statewide Network Importance
	User Benefits (\$1000)	Cost (\$1000)	Economic Development Potential	Environmental		
				Impact Positive	Probability Negative	
HIGH PRIORITY						
US 1 Relocation	30,158	32,780	.24	.80	.40	2
NC 24/27 Widening w/Carthage bypass	14,200	13,902	.12	.70	.20	1
NC 211 W. Widening	16,400	10,469	.14	.35	.10	0
MEDIUM PRIORITY						
US 15/501 Widening	8,600	10,616	.14	.50	.20	0
NC 211 S. Widening	6,200	2,170	.08	.20	.10	0
LOW PRIORITY						
NC 705 Widening	100	496	.08	.25	.10	0

VII. IMPLEMENTATION

There are several tools which are available for use by a county to assist in the implementation of a Thoroughfare Plan. They are as follows:

State-County Adoption of Thoroughfare Plan

The Department of Transportation, in cooperation with Moore County, has cooperatively developed this county thoroughfare plan. If mutually adopted by the Department and the County, the approved plan will serve as a guide to the Department of Transportation in the development of the road and highway system of the County. The approval of the plan by the County will enable standard road regulations and land use controls to be used effectively to assist in the implementation of the plan.

Subdivision Controls

Subdivision regulations require every subdivider to submit to the county planning board a plan of the proposed subdivision and require that the subdivision be constructed to certain standards. Through this process, it is possible to require the subdivision streets to conform to the thoroughfare plan and to reserve or protect necessary rights-of-way for projected roads and highways that are to become a part of the thoroughfare plan. The construction of subdivision streets to adequate standards will reduce maintenance costs and will facilitate the transfer of the streets to the State Highway System. Appendix C outlines the Recommended Design Standards of the Department of Transportation.

Land Use Controls

Land use regulations are an important tool in that they regulate future land development and minimize undesirable development along roads and highways. The land use regulatory system can improve highway safety by requiring sufficient building setbacks to provide for adequate sight distances and by requiring off-street parking.

Funding

Funding for the improvements recommended in this plan comes through the Department's Transportation Improvement Program and the Secondary Roads Program. The Board of Transportation regularly conducts public meetings to obtain input from the public of their needs for highway improvements. The recommendations made in this report/plan can be utilized by the county to decide on future street priorities and aid in the documentation of project needs.

Nearly all secondary road work is done on a county by county basis. These funds (county construction account) are used to stabilize dirt roads, make minor alignment improvements, and even construct short connectors when appropriate. The county commissioners are encouraged to work with the Division Engineer when preparing the county's priority list.

MMB/wp

APPENDICES

APPENDIX A

Aberdeen-Southern Pines Thoroughfare Plan



REVISIONS			
ABERDEEN AREA	SOUTHERN PINES AREA	RECOMMENDED APPROVAL BY PLANNING AND RESEARCH BRANCH	NORTH CAROLINA BOARD OF TRANSPORTATION
	10-16-77	10-17-77	1-13-78

THOROUGHFARE PLAN
 PUBLIC HEARING IN ABERDEEN ON JUNE 13, 1977
 ADOPTED BY ABERDEEN ON JUNE 13, 1977
 PUBLIC HEARING IN SOUTHERN PINES ON JULY 26, 1977
 ADOPTED BY SOUTHERN PINES ON OCTOBER 14, 1977

RECOMMENDED APPROVAL BY PLANNING AND RESEARCH BRANCH ON OCTOBER 17, 1977
 ADOPTED BY NORTH CAROLINA BOARD OF TRANSPORTATION ON JANUARY 13, 1978

LEGEND		
THOROUGHFARE	EXISTING ALIGNMENT	PROPOSED ALIGNMENT
MAJOR		
MINOR		
LONG RANGE		
INTERCHANGE	●	●
GRADE SEPARATION	○	○



ABERDEEN AND SOUTHERN PINES THOROUGHFARE PLAN

JUNE 13, 1977



APPENDIX B

THOROUGHFARE TABULATIONS

Typical Cross Sections

Typical cross sections recommended by the Thoroughfare Planning Unit are shown in Appendix B, Figure B-1, and listed in Appendix B, Table 1.

Cross section "A" is typical for controlled access freeways. The 46 foot grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Slopes of 8:1 into 3 foot drainage ditches are desirable for traffic safety. Right-of-way requirements would typically vary upward from 250 feet depending upon cut and fill requirements.

Cross section "B" is typical for four lane divided highways in rural areas which may have only partial or no control of access. The minimum median width for this cross section is 30 feet, but a wider median is desirable. Design requirements for slopes and drainage would be similar to cross section "A", but there may be some variation from this depending upon right-of-way constraints.

Cross section "C", seven lane urban, and cross section "D", five lane urban, are typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "E" and "F" are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections.

Cross section "G" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 feet is recommended with 30 feet being desirable.

Typical cross section "H" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections.

Thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "I". Cross section "J" and "K" are usually recommended for minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "J" would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

Cross section "L" is used in rural areas or for staged construction of a wider multilane cross section. On some thoroughfares projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time.

The curb and gutter urban cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk further away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

Right-of-ways shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

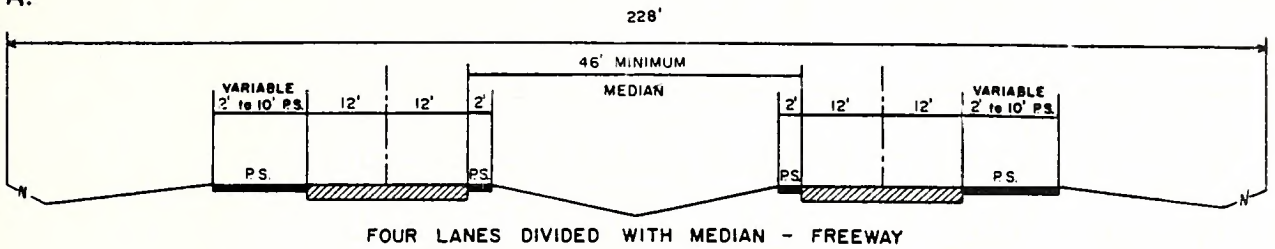
If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facility and Program Handbook¹ should be consulted for design standards for bicycle facilities.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service and available right-of-way.

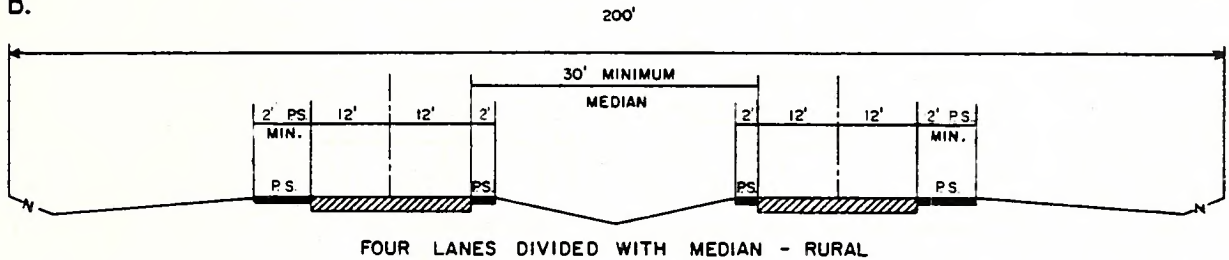
¹The North Carolina Bicycle Facility and Program Handbook, Barton-Aschman Associates, Inc., April, 1975.

TYPICAL THOROUGHFARE CROSS SECTIONS

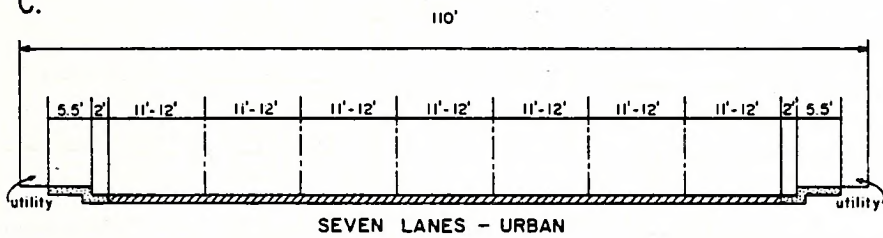
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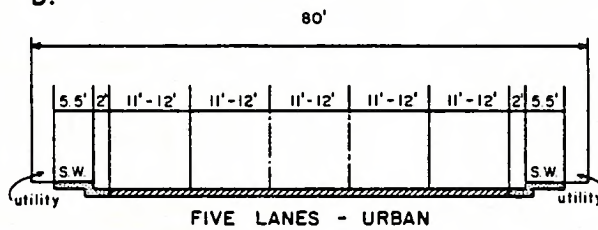
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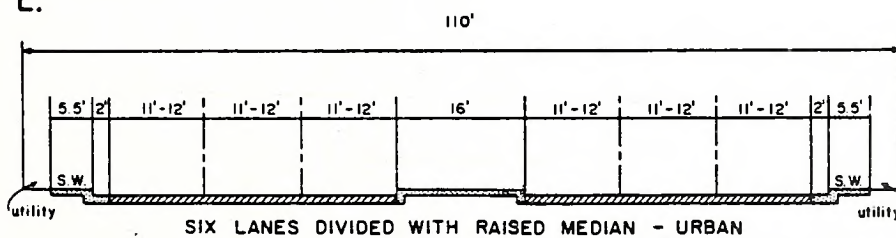
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D.

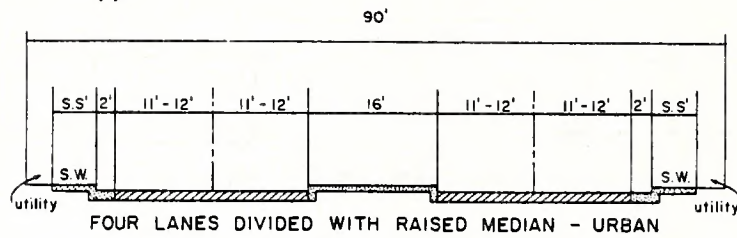


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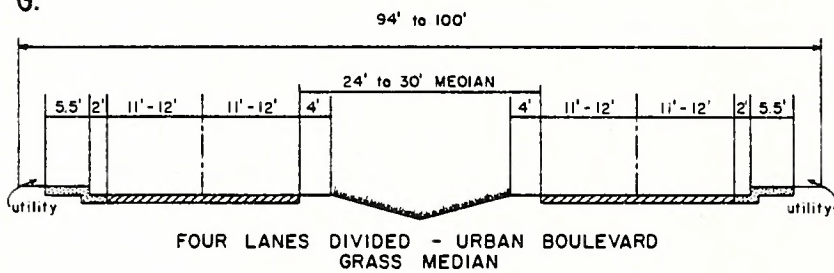


TYPICAL THOROUGHFARE CROSS SECTIONS (CONTINUED)

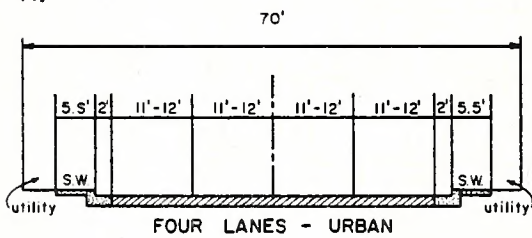
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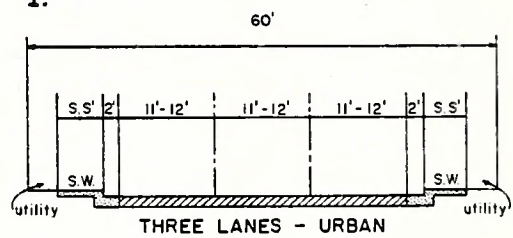
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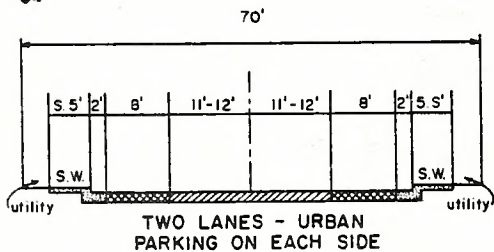
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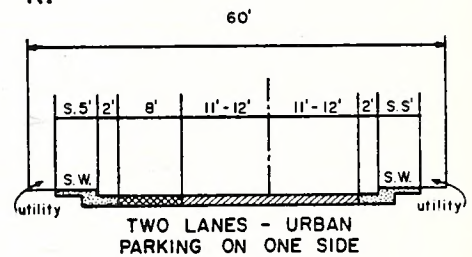
I.



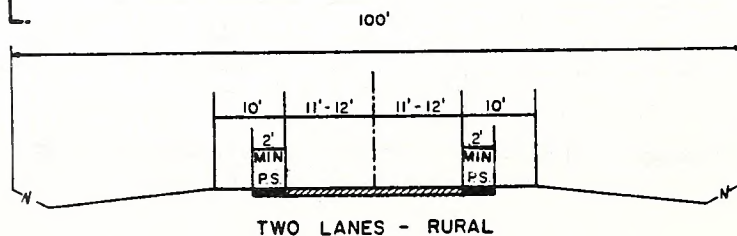
J.



K.



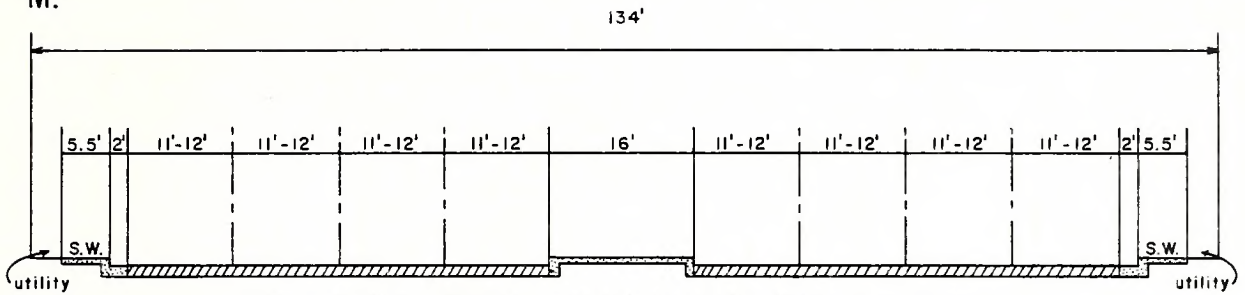
L.



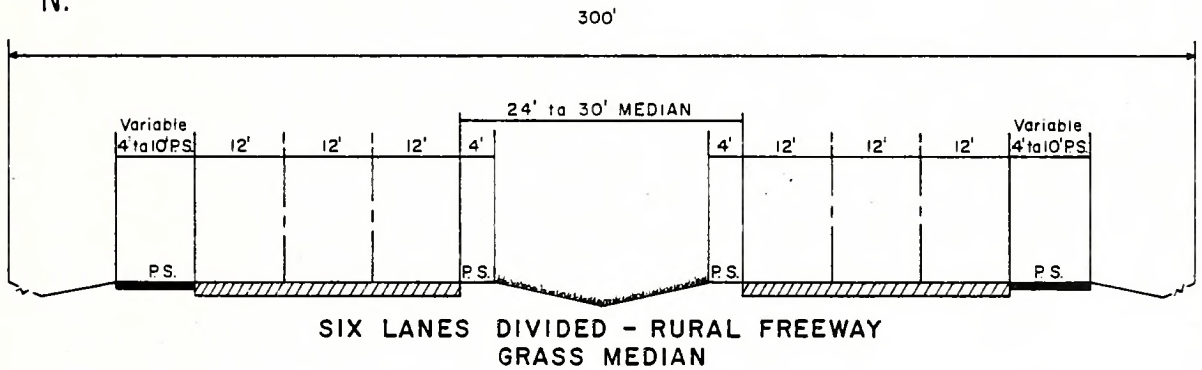
TYPICAL THOROUGHFARE CROSS SECTIONS

(CONTINUED)

M.



N.



APPENDIX B
MOORE COUNTY
THOROUGHFARE PLAN STREET TABULATIONS AND RECOMMENDATIONS

FACILITY AND SECTION	EXISTING				RECOMMENDED			
	X-SECT.		SERVICE		X-SECT.			
	DIST	RWY	ROW	VOLUME	1985	2005	RWY	ROW
	MI.	FT.	FT.	(FUTURE)	ADT	ADT		
EXISTING FACILITIES								
(NEW FACILITIES LISTED AT END OF TABLE)								
*** US HIGHWAY 1 ***								
RICHMOND CO. - SCL PINE BLUF	2.86	22	100	5140	4000	7200	B	200
				(50,000)				
SCL PNE BLUF - NCL PINE BLUF	1.53	48	120	30400	4500	8100	ADQ	ADQ
NCL PNE BLUF - SR 1107	0.91	48	150	30400	6000	10800	ADQ	ADQ
SR 1107 - SCL ABERDEEN	0.95	46	150	29500	7600	13700	ADQ	ADQ

NCL S. PINES - MP 14.39	2.15	48	260	30400	7000	13000	ADQ	ADQ
MP 14.39 - MP 16.96	2.57	46	200	29500	7000	13000	ADQ	ADQ
MP 16.96 - MP 17.76	0.80	48	200	30400	7000	13000	ADQ	ADQ
MP 17.76 - FUTURE US 1	0.19	22	100	4750	7000	13000	B	200
				(50,000)				
FUTURE US 1 - SCL VASS	0.33	22	100	4750	8000	15000	ADQ	ADQ
NCL VASS - NC HWY 24-27	4.08	22	100	4390	5300	9600	ADQ	ADQ
NC HWY 24-27 - SR 1007	0.63	24	100	4710	5000	9000	ADQ	ADQ
SR 1007 - LEE COUNTY	0.72	22	100	4390	5000	9000	ADQ	ADQ
***US HIGHWAY 15-501 ***								
HOKE COUNTY - SCL ABERDEEN	3.63	22	100	6400	3500	5700	ADQ	ADQ

NC 211 - NC HWY 73	3.62	24	100	8500	4400	7900	D	ADQ
				(40,000)				
NC HWY 73 - NC HWY 22	3.69	24	100	8500	4400	7200	D	ADQ
NC HWY 22S - NC HWY 22 N	0.95	24	100	8500	6000	9800	D	ADQ
NC HWY 22 N - NC HWY 24-27W	2.14	24	100	8500	5500	9000	D	ADQ
NC 24-27 W - NC 24-27 E	1.78	24	60	5300	4400	7200	D	100
NC 24-27 E - LEE COUNTY	5.35	24	60	8150	2800	4600	ADQ	ADQ
*** NC HIGHWAY 22 ***								
SP URBN BDRY - US 15-501 S	5.46	20	60	7120	2100	3400	ADQ	ADQ
(COMMON W/ US 15 501)								
US 15-501 N - SCL CARTHAGE	1.36	24	60	8470	4000	5900	ADQ	ADQ

WCL CARTHAGE - SR 1261	0.09	20	60	4400	5200	3000	ADQ	ADQ
SR 1261 - NC 24-27 W	3.73	22	60	5000	4000	7700	B	200
				(50,000)				
NC 24-27 W - MP 23.46	6.96	20	100	7270	700	900	ADQ	ADQ
MP 23.46 - MP 24.56	1.10	22	60	8050	700	900	ADQ	ADQ
MP 24.56 - CHATHAM CO.	1.81	20	100	7270	1000	1200	ADQ	ADQ

APPENDIX B
MOORE COUNTY

THOROUGHFARE PLAN STREET TABULATIONS AND RECOMMENDATIONS

FACILITY AND SECTION	EXISTING				RECOMMENDED			
	X-SECT.		SERVICE		X-SECT			
	DIST	RWY	ROW	VOLUME	1985	2005	RWY	ROW
	MI.	FT.	FT.	(FUTURE)	ADT	ADT		
*** NC HIGHWAY 24-27 ***								
MONTGOMRY CO - NC HWY 705	9.53	24	100	4900	2500	5000	B	200
				(50,000)				
NC HWY 705 - NC HWY 22 N	5.13	22	60	4750	3200	6400	B	200
				(50,000)				
(COMMON WITH NC 22 TO CARTHAGE)								
ECL CARTHAGE - US 15/501	0.55	22	60	4400	5000	8000	ADQ	ADQ
(COMMON WITH US 15-501)								
US 15-501 N - US HWY 1	6.79	20	60	4800	1100	1600	ADQ	ADQ
US HWY 1 - WCL CAMERON	0.13	20	60	4800	1740	2600	ADQ	ADQ
WCL CAMERON - ECL CAMERON	1.10	20	60	4800	2100	3100	ADQ	ADQ
ECL CAMERON - HARNETT CO	3.31	20	60	4800	2100	3100	ADQ	ADQ
*** NC HIGHWAY 73 ***								
MONTGOMRY CO - WCL JACK SPR	0.82	20	60	6200	700	900	ADQ	ADQ

ECL JACK SPR - NC HWY 211 S	2.88	20	60	6200	1000	1300	ADQ	ADQ
(COMMON WITH NC 211)								
NC HWY 211 N - US HWY 15-501	7.58	20	60	6330	1600	2400	ADQ	ADQ
*** NC HIGHWAY 211 ***								
HOKE COUNTY - ECL ABERDEEN	2.36	24	60	9570	6000	11900	B	200
				(50,000)				

WCL PINEHURST- MP 16.73	5.31	24	100	8600	4900	10700	D	ADQ
				(40,000)				
MP 16.73 - NC HWY 73 E	0.24	58	60	30000	4000	7000	ADQ	ADQ
NC HWY 73 E - NC HWY 705	5.51	24	100	8550	5800	9500	B	150
				(50,000)				
NC HWY 705 - MONTGOMERY CO	4.37	24	150	8550	3400	5600	ADQ	ADQ
*** NC HIGHWAY 705 ***								
NC HWY 211 - NC HWY 24-27	9.31	20	60	6070	1400	2500	ADQ	ADQ
NC HWY 24-27 - SCL ROBBINS	1.63	20	60	6070	3688	6700	24	ADQ
				(9000)				

NCL ROBBINS - RANDOLPH CO	9.53	20	60	7120	2400	3600	ADQ	ADQ
***SECONDARY ROAD 1001 ***								
CUMBERLAND CO - MP 0.60	0.60	20	N A	7120	1000	1800	ADQ	ADQ
MP 0.60 - SR 2017	3.80	18	N A	5930	1000	1800	ADQ	ADQ
SR 2017 - SR 2017	0.80	24	N A	8470	1000	1800	ADQ	ADQ
SR 2017 - MP 8.10	2.90	24	N A	8470	1000	1800	ADQ	ADQ
MP 8.10 - ECL VASS	3.50	22	N A	7880	1200	2200	ADQ	ADQ
ECL VASS - US HWY 1	1.15	24	N A	8470	2200	4000	ADQ	ADQ

APPENDIX B
MOORE COUNTY
THOROUGHFARE PLAN STREET TABULATIONS AND RECOMMENDATIONS

FACILITY AND SECTION	EXISTING				RECOMMENDED			
	X-SECT.		SERVICE		X-SECT			
	DIST	RWY	ROW	VOLUME	1985	2005	RWY	ROW
	MI.	FT.	FT.	(FUTURE)	ADT	ADT		
SECONDARY ROAD 1002								
MONTGOMRY CO - SCL ROBBINS	9.72	18	N A	5930	700	1000	ADQ	ADQ
SECONDARY ROAD 1003								
RANDOLPH CO - NC HWY 705	4.20	22	N A	7880	400	600	ADQ	ADQ
SECONDARY ROAD 1004								
RICHMOND CO - SCL FOXFIRE	7.57	18	N A	5930	300	400	ADQ	ADQ
NCL FOXFIRE - NC HWY 211	3.57	18	N A	5930	300	500	ADQ	ADQ
SECONDARY ROAD 1006								
US 15-501 - SR 1644	6.40	22	100	7880	500	700	ADQ	ADQ
SR 1644 - SR 1677	1.00	22	N A	7880	400	500	ADQ	ADQ
SR 1677 - SR 1629	3.10	22	N A	7880	400	500	ADQ	ADQ
SR 1629 - CHATHAM CO	2.70	22	N A	7880	400	500	ADQ	ADQ
SECONDARY ROAD 1007								
NCL CAMERON - US 15-501	3.70	20	N A	7120	300	400	ADQ	ADQ
SECONDARY ROAD 1100								
Hoke County - SR 1101	2.00	18	N A	5930	250	300	ADQ	ADQ
SECONDARY ROAD 1101								
SR 1100 - SR 1102	0.22	18	60	5930	250	300	ADQ	ADQ
SECONDARY ROAD 1102								
SR 1101 - SR 1103	0.80	18	N A	5930	600	800	ADQ	ADQ
SR 1103 - US HWY 1	0.67	18	N A	5930	250	300	ADQ	ADQ
SECONDARY ROAD 1112								
ABRDN URB BD - SR 1113	4.00	18	N A	5930	1000	1500	ADQ	ADQ
SECONDARY ROAD 1113								
SR 1112 - SR 1004	3.03	18	N A	5930	400	600	ADQ	ADQ
SECONDARY ROAD 1126								
SR 1137 - NCL JACK SPR	0.32	18	N A	5930	500	700	ADQ	ADQ
SECONDARY ROAD 1137								
NC HWY 211 - SR 1126	4.17	18	N A	5930	200	300	ADQ	ADQ
SECONDARY ROAD 1210								
NC HWY 211 - SR 1216	1.60	18	N A	5930	1500	2400	ADQ	ADQ
SR 1216 - NC HWY 73	2.40	18	N A	5930	500	800	ADQ	ADQ
NC HWY 73 - SR 1240	4.50	18	N A	5930	400	600	ADQ	ADQ
SR 1240 - SR 1261	3.20	18	N A	5930	400	600	ADQ	ADQ
SR 1261 - NC HWY 24-27	4.20	18	N A	5930	400	600	ADQ	ADQ

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FACILITY AND SECTION	EXISTING				RECOMMENDED			
	X-SECT.		SERVICE		X-SECT			
	DIST	RWY	ROW	VOLUME	1985	2005	RWY	ROW
	MI.	FT.	FT.	(FUTURE)	ADT	ADT		
***SECONDARY ROAD 1224 ***								
SR 1229 - US 15-501	3.40	18	N A	5930	500	800	ADQ	ADQ
***SECONDARY ROAD 1227 ***								
SR 1224 - SR 1229	0.80	20	N A	7120	250	400	ADQ	ADQ
***SECONDARY ROAD 1229 ***								
NC HWY 73 - SR 1210	4.60	22	N A	7880	600	1000	ADQ	ADQ
SR 1210 - SR 1227	0.90	20	N A	7120	600	1000	ADQ	ADQ
***SECONDARY ROAD 1239 ***								
NC HWY 211 - SR 1229	2.00	22	N A	7880	1900	3400	ADQ	ADQ
***SECONDARY ROAD 1281 ***								
NC HWY 24-27 - MONTGOMRY CO	1.60	22	N A	7880	380	500	ADQ	ADQ
***SECONDARY ROAD 1405 ***								
NC HWY 705 - MONTGOMRY CO	6.00	18	N A	5930	500	700	ADQ	ADQ
***SECONDARY ROAD 1419 ***								
NC HWY 705 - SR 1003	3.20	22	N A	7880	650	1000	ADQ	ADQ

SR 1456 - SR 1452	1.80	20	N A	7120	190	300	ADQ	ADQ
SR 1452 - SR 1470	1.60	18	N A	5930	160	200	ADQ	ADQ
***SECONDARY ROAD 1456 ***								
SR 1003 - RANDOLPH CO	4.30	18	N A	5930	1000	1500	ADQ	ADQ
***SECONDARY ROAD 1461 ***								
NC HWY 22 - SR 1456	0.80	18	N A	5930	500	700	ADQ	ADQ
***SECONDARY ROAD 1470 ***								
NC HWY 22 - SR 1419	2.70	24	N A	8470	3700	5500	ADQ	ADQ
SR 1419 - NCL ROBBINS	2.50	24	N A	8470	2100	3100	ADQ	ADQ
***SECONDARY ROAD 1477 ***								
NC HWY 24-27 - MF 4.31	4.31	20	N A	7120	1800	2700	ADQ	ADQ
MF 4.31 - ECL ROBBINS	1.40	18	N A	5930	1800	2700	ADQ	ADQ
ECL ROBBINS - MF 6.17	0.46	18	N A	5930	2100	3100	ADQ	ADQ
MF 6.17 - NC HWY 705	0.35	20	N A	7120	2100	3100	ADQ	ADQ
***SECONDARY ROAD 1479 ***								
SR 1477 - SR 1470	2.50	18	N A	5930	250	400	ADQ	ADQ
***SECONDARY ROAD 1600 ***								
SR 1006 - SR 1606	2.60	18	N A	5930	250	300	ADQ	ADQ
SR 1606 - NC HWY 22	3.90	18	N A	5930	600	800	ADQ	ADQ

APPENDIX B
MOORE COUNTY
THOROUGHFARE PLAN STREET TABULATIONS AND RECOMMENDATIONS

FACILITY AND SECTION	EXISTING				RECOMMENDED			
	X-SECT.		SERVICE		X-SECT			
	DIST.	RWY	ROW	VOLUME	1985	2005	RWY	ROW
	MI.	FT.	FT.	(FUTURE)	ADT	ADT		
SECONDARY ROAD 1621								
SR 1006 - CHATHAM CO	5.20	22	N A	7880	200	300	ADQ	ADQ
***SECONDARY ROAD 1629 ***								
NC HWY 22 - SR 1006	6.20	18	N A	5930	250	300	ADQ	ADQ
***SECONDARY ROAD 1802 ***								
SR 1803 - NCL WHIS PNES	1.00	18	N A	5930	1150	1700	ADQ	ADQ
SCL WHS PNES - MP 7.18	0.70	18	N A	5930	850	1300	ADQ	ADQ
MP 7.18 - SR 1857	3.00	18	N A	5930	940	1400	ADQ	ADQ
***SECONDARY ROAD 1803 ***								
SR 1802 - SR 1831	3.90	20	N A	7120	840	1200	ADQ	ADQ
SR 1831 - WCL VASS	5.00	20	N A	7120	800	1300	ADQ	ADQ
***SECONDARY ROAD 1805 ***								
NCL VASS - SR 1804	8.00	22	N A	7880	1240	2200	ADQ	ADQ
***SECONDARY ROAD 1809 ***								
SR 1805 - NC HWY 24-27	1.56	22	N A	7880	830	1100	ADQ	ADQ
***SECONDARY ROAD 1814 ***								
NC HWY 24-27 - SR 1815	0.70	18	N A	5930	200	300	ADQ	ADQ
***SECONDARY ROAD 1815 ***								
US 15-501 - SR 1814	1.76	18	N A	5930	530	700	ADQ	ADQ
***SECONDARY ROAD 1825 ***								
HARNETT CO - US HIGHWAY 1	3.50	18	N A	5930	700	900	ADQ	ADQ
***SECONDARY ROAD 1831 ***								
SR 1832 - SR 1803	2.10	20	60	7120	600	900	ADQ	ADQ
SR 1803 - SR 1838	0.60	18	N A	5930	600	900	ADQ	ADQ
***SECONDARY ROAD 1832 ***								
SR 1805 - SR 1831	1.40	18	N A	5930	600	900	ADQ	ADQ
***SECONDARY ROAD 1838 ***								
US 15-501 - NC 22	1.80	20	N A	7120	600	900	ADQ	ADQ
NC 22 - SR 1831	1.60	20	N A	6000	200	300	ADQ	ADQ
***SECONDARY ROAD 1843 ***								
SR 1853 - ECL WHS PNES	3.50	18	N A	5930	1100	2400	ADQ	ADQ

WCL WHS PNES - NC HWY 22	1.40	24	N A	8470	550	1200	ADQ	ADQ
***SECONDARY ROAD 2001 ***								
LEE COUNTY - NC HWY 24-27	0.80	18	N A	5930	300	400	ADQ	ADQ

APPENDIX B
MOORE COUNTY
THOROUGHFARE PLAN STREET TABULATIONS AND RECOMMENDATIONS

FACILITY AND SECTION	EXISTING				RECOMMENDED			
	X-SECT.		SERVICE		X-SECT			
	DIST	RWY	ROW	VOLUME	1985	2005	RWY	ROW
	MI.	FT.	FT.	(FUTURE)	ADT	ADT		
*** SECONDARY ROAD 2018 ***								
SR 1001 - HARNETT CO	1.50	18	N A	5930	500	700	ADQ	ADQ
*** SECONDARY ROAD 2022 ***								
SR 2023 - SR 1001	0.40	20	N A	7120	300	400	ADQ	ADQ
*** SECONDARY ROAD 2023 ***								
SR 2026 - SR 2022	6.30	20	N A	7120	460	700	ADQ	ADQ
*** SECONDARY ROAD 2026 ***								
ECL S PINES - SR 2023	4.80	20	N A	7120	400	600	ADQ	ADQ
*** NEW FACILITIES ***								
*** US 1 RELOCATION ***								
END OF EXISTING 4 LANE SECTION TO LEE CO	7.50	-	-	(40000)	4000	8000	B	200
*** CARTHAGE BYPASS ***								
US 15/501 TO SR 1281	12.30	-	-	(10600)	4000	7700	L	80

NOTES:

INVENTORY DOES NOT INCLUDE ROADWAY SEGMENTS WITHIN THE FOLLOWING
DEVELOPED AREAS: ABERDEEN-SOUTHERN PINES, PINEHURST, CARTHAGE,
VASS, AND ROBBINS

----- INDICATES GAP IN INVENTORY WHERE ROADWAY PASSES THROUGH
DEVELOPED AREA

VOLUMES REFLECT HIGHEST AVERAGE DAILY TRAFFIC (ADT) FOR
GIVEN SEGMENT.

RECOMMENDED CROSS-SECTIONS: EXISTING CROSS-SECTIONS ARE CONSIDERED
ADEQUATE (ADQ) UNLESS OTHERWISE INDICATED; RECOMMENDED SECTIONS
REFER TO FIGURES ON PAGES B-3 THROUGH B-5.

APPENDIX C

RECOMMENDED DEFINITIONS AND DESIGN STANDARDS FOR SUBDIVISION ORDINANCES

DEFINITIONS:

I. Streets and Roads:

A. Rural Roads

1. Principal Arterial - A rural link in a network of continuous routes serving corridor movements having trip length and travel density characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.
2. Minor Arterial - A rural link in a network joining cities and larger towns and providing intrastate and intercounty service at relatively high overall travel speeds with minimum interference to through movement.
3. Major Collector - A road which serves major intracounty travel corridors and traffic generators and provides access to the Arterial system.
4. Minor Collector - A road which provides service to small local communities and links the locally important traffic generators with their rural hinterland.
5. Local Road - A local road that serves primarily to provide access to adjacent land and for travel over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of Interstate, other freeway, expressway, or parkway links, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.
2. Minor Thoroughfares - Minor thoroughfares are important streets in the city system and perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating a minor through-traffic movement and may also serve abutting property.

3. Local Street - A local street is any link not on a higher-order urban system and serves primarily to provide direct access to abutting land and access to higher systems.

C. Specific Type Rural or Urban Streets

1. Freeway, expressway, or parkway - Divided multilane roadways designed to carry large volumes of traffic at relatively high speeds. A freeway is a divided highway providing for continuous flow of vehicles with no direct access to abutting property or streets and with access to selected crossroads provided via connecting ramps. An expressway is a divided highway with full or partial control of access and generally with grade separations at major intersections. A parkway is a highway for noncommercial traffic, with full or partial control of access, and usually located within a park or a ribbon of parklike development.
2. Residential Collector Street - A local access street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.
3. Local Residential Street - Cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.
4. Cul-de-sac - A short street having but one end open to traffic and the other end being permanently terminated and a vehicular turnaround provided.
5. Frontage Road - A local street or road that is parallel to a full or partial access controlled facility and functions to provide access to adjacent land.
6. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

- A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.
- B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.
- C. Lot - A portion of a subdivision, or any other parcel of land, intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

1. Corner Lot - A lot abutting upon two streets at their intersection.
2. Double-Frontage Lot - A continuous (through) lot which is accessible from both of the parallel streets upon which it fronts.
3. Reverse-Frontage Lot - A continuous (through) lot which is accessible from only one of the parallel streets upon which it fronts.

III. Subdivision

- A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.
- B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, whether immediate or future, of sale or building development, and all divisions of land involving the dedication of a new street or a change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or recombination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than five acres where no street right-of way dedication is involved; (3) the public acquisition by purchase of strips of land for the widening or opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than two acres into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.
- C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. Since a transfer of property is involved, the dedication is made by written instrument and is completed with an acceptance.
- D. Reservation - A reservation of land does not involve any transfer of property rights. It simply constitutes an obligation to keep property free from development for a stated period of time.

Design Standards

I. Streets and Roads:

The design of all streets and roads within _____ shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHO) manuals.

The provision of street rights-of-way shall conform and meet the requirements of the thoroughfare plan for _____ as adopted by the _____ and the North Carolina Department of Transportation.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

The urban planning area shall consist of that area within the urban planning boundary as depicted on the mutually adopted _____ Thoroughfare Plan. The rural planning area shall be that area outside the urban planning boundary.

- A. Right-of-Way Widths: Right-of-way widths shall not be less than the following and shall apply except in those cases where right-of-way requirements have been specifically set out in the Thoroughfare Plan.

Min. Right of Way, Ft.

1. Rural

a.	Principal Arterial	
	Freeways	350
	Other	200
b.	Minor Arterial	100
c.	Major Collector	100
d.	Minor Collector	100
e.	Local Road	*60

*The desirable minimum right-of-way is 60 feet. If curb and gutter is provided, 50 feet of right-of-way is adequate on local residential streets.

2. Urban

- | | | |
|----|--|------------|
| a. | Major Thoroughfare Other
than Freeway and
Expressway | 90 |
| b. | Minor Thoroughfare | 70 |
| c. | Local Street | *60 |
| d. | Cul-de-sac | **Variable |

The subdivider will only be required to dedicate a maximum of 100 feet of right-of-way. In cases where over 100 feet of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. In all cases in which right-of-way is sought for an access controlled facility, the subdivider will only be required to make a reservation.

A partial width right-of-way, not less than sixty (60) feet in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is subdivided, the remainder of the full required right-of-way shall be dedicated.

- B. Street Widths: Widths for street and road classifications other than local shall be as required by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential
Curb and gutter section 26 feet,
to face of curb
Shoulder section - 20 feet to edge of
pavement, 4 foot shoulders

*The desirable minimum right-of-way is established as 60 feet. If curb and gutter is provided, 50 feet of right-of-way is adequate.

**The right-of-way dimension will depend on radius used for vehicular turnaround. Distance from edge of pavement of turnaround to right-of-way should not be less than distance from edge of pavement to right-of-way on street approaching turnaround.

2. Residential Collector

Curb and gutter section 34 feet, face
to face of curb

Shoulder Section 20 feet to edge of
pavement, 6 foot shoulders

- C. Geometric Characteristics: The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. Design Speed

The design speeds for subdivisions type streets shall be:

	Desirable	(Minimum)		
		Level	Rolling	Mountainous
Rural				
Minor Collector Roads	60	(50)	(40)	(30)
Local Roads including Residential Collectors and Local Residential	50	(50)*	(40)*	(30)*
Urban				
Major Thoroughfares Other than Freeway or Expressway	60	(50)	(50)	(50)
Minor Thoroughfares	60	(50)	(40)	(40)
Local Streets	40	(40)**	(30)**	(20)**

*Based on projected annual average daily traffic of 400-750. In cases where road will serve a very limited area and small number of dwelling units, minimum design speeds can be reduced further.

**Based on projected annual average daily traffic of 50-250.

2. Maximum and Minimum Grades

- a. The maximum grades in percent shall be:

Design Speed	Level	Rolling	Mountainous
60	3	4	6
50	4	5	7
40	5	6	8
30		9	10
20			12

- b. A minimum grade for curbed streets normally should not be less than 0.5%, a grade of 0.35% may be allowed where there is a high type pavement accurately crowned and in areas where special drainage conditions may control.
- c. Grades for 100 feet each way from intersections should not exceed 5%.
- d. For streets and roads with projected annual average daily traffic less than 250, short grades less than 500 feet long, may be 150% greater.

3. Minimum Sight Distances

In the interest of public safety, no less than the minimum sight distance applicable shall be provided in every instance. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters. (General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case):

<u>Design Speed, MPH</u>	<u>20</u>	<u>30</u>	<u>40</u>	<u>50</u>	<u>60</u>
Stopping Sight Distance -					
Min. Distance, Ft.	150	200	275	350	475
Des. Distance, Ft.	150	200	300	450	650
Min. K* Value For:					
Min. Crest Curve	16	28	55	85	160
Des. Crest Curve	16	28	65	145	300
Min. SAG Curve	24	35	55	75	105
Des. SAG Curve	24	35	60	100	155
Passing Sight Distance -					
Min. Passing Distance, Feet (2 lane)		1100	1500	1800	2100
Min. K* Value For Crest Vertical Curve		365	686	985	1340

Sight distance provided for stopped vehicles at intersections should be in accordance with, "A Policy on Geometric Design of Rural Highways".

4. The following table shows the maximum degree of curve and related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is .08. The maximum rate of superelevation for urban streets with curb and gutter is .06 with .04 being desirable.

*K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve which will provide minimum sight distance.

Design Speed MPH	Maximum e*	Minimum Radius (Rounded) Feet	Maximum Degree of Curve (Rounded) Degrees
20	.04	125	45.0
30	.04	300	19.0
40	.04	560	10.0
50	.04	925	6.0
60	.04	1410	4.0
20	.06	115	50.0
30	.06	275	21.0
40	.06	510	11.5
50	.06	830	7.0
60	.06	1260	4.5
20	.08	110	53.5
30	.08	250	23.0
40	.08	460	12.5
50	.08	760	7.5
60	.08	1140	5.0

*e = rate of roadway superelevation, foot per foot

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty (60) degrees.
2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.
3. Off-set intersections are to be avoided unless exception is granted by the Division of Highways for intersections involving the State Highway System, or the Planning Board for intersections involving only the municipal street system. Intersections which cannot be aligned should be separated by a minimum length of 200 feet between survey centerlines.

E. Cul-de-sacs

Cul-de-sacs, unless exception is granted by the local planning board, shall not be more than five hundred (500) feet in length. The distance from the edge of pavement on the vehicular turnaround to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turnaround. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provision is made for service access.

Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least twenty (20) feet.
3. Deadend alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turnaround facilities at the deadend as may be approved by the Planning Board.
4. Sharp changes in alignment and grade shall be avoided.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the nearest District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

I. Wheel Chair Ramps

In accordance with Chapter 136, Article 2A, §136-44.14, all street curbs in North Carolina being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason after September 1, 1973, shall provide wheelchair ramps for the physically handicapped at all intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Wheelchair ramps and depressed curbs shall be constructed in accordance with details contained in the Department of Transportation, Division of Highways, Publication entitled, "Guidelines, Curb Cuts and Ramps for Handicapped Persons".

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

- a. Shoulder Section Approach

- i. Under 800 ADT Design Year

- Minimum 28 feet width face to face of parapets of rails or pavement width plus 10 feet, whichever is greater.

- ii. 800-2000 ADT Design Year

- Minimum 34 feet width face to face of parapets or rails or pavement width plus 12 feet, whichever is greater.

- iii. Over 2000 ADT Design Year

- Minimum 40 feet
Desirable 44 feet width face to face of parapets or rails.

- b. Curbs and Gutter Approach

- i. Under 800 ADT Design Year

- Minimum 24 feet face to face of curbs.



ii. Over 800 ADT Design Year

Width of approach pavement measured face to face of curbs.

Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be 1'6" minimum, or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:
 - a. Shoulder Section Approach - Width of approach pavement plus width of usable shoulders on the approach left and right.
Min. 8'
Des. 10'
 - b. Curb and Gutter Approach - Width of approach pavement measured face to face of curbs.

